Name: _____

Show your work. Answers without work earn reduced credit.

1. [**3 points**] Write $\gcd(4959, 273)$ as a linear combination of 4959 and 273.

2. [**2 points**] How many of the integers in $\{1, 2, 3, \ldots, 99\}$ are relatively prime to 100?

3. [**2 points**] The prime factorization of $32,830$ is given by $32,830 = 2 \cdot 5 \cdot 7^2 \cdot 67$. Find $\varphi(32,830)$.

4. [**3 parts, 1 point each**] In the RSA algorithm, let $p = 5$ and $q = 17$. Then $n = 85$ and $\varphi(n) = 4 \cdot 16 = 64$. For the encryption key, pick $e = 5$.

   (a) Use the Euclidean algorithm to find the decryption key d.

   (b) Encode $T = 42$ using the public key (n, e).

   (c) Decode your answer to part (b) to retrieve the plain-text message 42.